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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/774,762
Filing Date: February 09, 2004
Appellant(s): DOAN ET AL.

Michael G. Fletcher
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed August 31, 2006 appealing from the Office action mailed March 17, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,262,352	Woo	11-1993
4,693,925	Cheung	9-1987

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 19-38 are rejected under 35 U.S.C. 102(e). Claims 39-42 are rejected under 35 U.S.C. 103(a). The rejections are set forth in prior Office Action, mailed on March 17, 2006.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 19-38 are rejected under 35 U.S.C. 102(e) as being anticipated by Woo et al. (US 5,262,352, previously cited).

Regarding claims 19 and 27, Woo discloses a single first planarization layer (14 and/or 15) disposed on a semiconductor substrate (10), a barrier film (16) having a structural integrity disposed on the first planarization layer, a single second planarization layer (17 and/or 18 and/or 20) disposed on the barrier film (col. 3, ln. 22 - col. 4, ln. 15). Inherently, the first and second planarization layers have reflow temperatures and thermal coefficients of expansion. Woo does not specifically disclose that the second layer is isolated from the first layer when a temperature of 700°C or greater is applied. However, because the first layer, barrier layer, and second layer are made of the same materials as those of Applicant's invention, it appears that the layered structure of Woo would inherently possess the function of the second layer is isolated from the first layer when a temperature of 700°C or greater is applied. See *In re Swinehart*, 439 F.2d 210, 212-13, 169 USPQ 226, 229 (CCPA 1971) "where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristics relied on "); and *In re Fitzgerald*, 619 F.2d 67, 205 USPQ 594 (CCPA 1980) (a case indicating that the burden of proof can be shifted to the applicant to show that the subject matter of the prior art does not possess the characteristic relied on whether the rejection is based on inherency under 35 U.S.C. 102 or obviousness under 35 U.S.C. 103). Additionally, it is noted that claims 19-38 are product claims. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the

product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

Regarding claim 20, Woo discloses that the barrier film can include silicon dioxide, silicon nitride or TEOS (col. 3, ln. 59 - col. 4, ln. 3).

Regarding claim 21, Woo discloses that the first planarization layer can include tungsten, titanium and polycrystalline silicon (col. 3, ln. 48-58).

Regarding claim 22, Woo discloses that the second planarization layer can include tungsten, titanium, polycrystalline silicon and TEOS (col. 4, ln. 4-11).

Regarding claims 23 and 24, Woo discloses that the second planarization layer can include a refractive metal (tungsten or titanium) (col. 4, ln. 4-11).

Regarding claim 25, Woo discloses that the second planarization layer can include TEOS (col. 4, ln. 11-15).

Regarding claims 26, 28 and 37, Woo discloses a first single layer (14 and/or 15), inherently having a thermal coefficient of expansion, a nitride film (16) superjacent the first layer, and a second single layer (17 and/or 18 and/or 20), inherently having another thermal coefficient of expansion, superjacent the nitride film (col. 3, ln. 22 - col. 4, ln. 15). Woo does not specifically disclose that the first and second layers are flowable at temperatures of at least 700°C. However, because the first and second layers are made of the same materials as those of Applicant's invention, it appears that

these layers of Woo would inherently possess the function of being flowable. See *In re Swinehart*, 439 F.2d 210, 212-13, 169 USPQ 226, 229 (CCPA 1971) "where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristics relied on");

Regarding claim 29, Woo discloses that the nitride film can include silicon nitride (col. 3, ln. 59 - col. 4, ln. 3).

Regarding claims 30-32, Woo discloses that the first layer can include tungsten, titanium and polycrystalline silicon (col. 3, ln. 48-58).

Regarding claim 33, Woo discloses a semiconductor substrate (10), a first single planarization layer (14 and/or 15), inherently having a thermal coefficient of expansion and a first reflow temperature, on the substrate, a barrier film (16) having structural integrity on the planarization layer, and a second single layer (17 and/or 18 and/or 20), inherently having a thermal coefficient of expansion, superjacent the barrier film (col. 3, ln. 22 - col. 4, ln. 15). Woo does not specifically disclose that the barrier film prevents the planarization layer and the second layer from interacting when heated. However, because the first layer, barrier layer, and second layer are made of the same materials as those of Applicant's invention, it appears that the layered structure of Woo would inherently possess the function of preventing the planarization layer and the "another layer" from interacting when heated. See *In re Swinehart*, 439 F.2d 210, 212-13, 169

USPQ 226, 229 (CCPA 1971) "where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristics relied on").

Regarding claim 34, Woo discloses that the barrier film can include silicon nitride, silicon dioxide and TEOS (col. 3, ln. 59 - col. 4, ln. 3).

Regarding claim 35, Woo discloses that the planarization layer can include tungsten, titanium and polycrystalline silicon (col. 3, ln. 48-58).

Regarding claim 36, Woo discloses that the second layer can include tungsten, titanium, polycrystalline silicon and TEOS (col. 4, ln. 4-11).

Regarding claim 38, Woo does not specifically disclose that the barrier film possesses the property of maintaining its structural integrity when heated to a temperature of at least 700°C. However, because the barrier layer is made of the same materials as that of Applicant's invention, it appears that the barrier film of Woo would inherently possess the function of maintaining its structural integrity when heated to a temperature of at least 700°C. See *In re Swinehart*, 439 F.2d 210, 212-13, 169 USPQ 226, 229 (CCPA 1971) "where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristics relied on").

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 39-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woo et al. (US 5,262,352) in view of Cheung et al. (US 4,693,925).

Regarding claim 39, Woo discloses a first layer (14 and/or 15), a second layer (17 and/or 18 and/or 20), and a barrier layer (16) in between the first and second layers (col. 3, ln. 22 - col. 4, ln. 15). Woo does not specifically disclose subjecting the first, second and barrier layers to a temperature of 700°C or greater. However, Woo does disclose depositing a polysilicon interconnection layer (24) and siliciding the polysilicon interconnection layer after the first, second and barrier layers have been formed (col. 5, ln. 26-27). Like Woo, Cheung discloses depositing a polysilicon interconnection layer and siliciding the polysilicon layer. Cheung teaches that the polysilicon can be successfully silicided by depositing a layer of refractory metal on the polysilicon layer and annealing the substrate at a temperature of 600-800°C (col. 5, ln. 44-50; col. 3, ln. 39-45). At the time of the invention, it would have been obvious to one of ordinary skill in the art to subject the first, second and barrier layers of Woo to an anneal of 700°C or greater because Woo discloses siliciding the polysilicon interconnection layer after the first, second and barrier layers have been formed and Cheung teaches that a polysilicon

interconnection layer can be successfully silicided by subjecting the polysilicon and metal layer to an anneal of 600-800°C.

Woo does not specifically disclose that the barrier film prevents the planarization layer and the second layer from interacting when heated. However, because the first layer, barrier layer, and second layer are made of the same materials as those of Applicant's invention, it appears that the layered structure of Woo would inherently possess the function of preventing the planarization layer and the "another layer" from interacting when heated. See *In re Swinehart*, 439 F.2d 210, 212-13, 169 USPQ 226, 229 (CCPA 1971) "where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristics relied on").

Regarding claim 40, Woo discloses that the first layer can include tungsten and/or titanium (col. 3, ln. 48-58).

Regarding claim 41, Woo discloses that the second layer can include tungsten and/or titanium and/or TEOS (col. 4, ln. 4-11).

Regarding claim 42, Woo discloses that the barrier film can include silicon nitride, silicon dioxide and TEOS (col. 3, ln. 59 - col. 4, ln. 3).

(10) Response to Argument

Rejection of Claims 19-38 under 35 U.S.C. 102(e)

Appellants argue that there is no evidence the cited layers taught by the Woo reference serve to planarize the film stack. This argument is unpersuasive. The claimed invention is a semiconductor device. As presented in the rejection, Woo discloses all the elements of the structure of the invention, including the claimed material of the layers. Intended use and other types of functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963). Whether the layers serve to planarize does not result in a structural difference between the claimed invention and the prior art, as the layers disclosed by Woo are planar.

Appellants argue that there is no evidence the cited layers taught by the Woo reference are flowable. This argument is unpersuasive. As elucidated in the rejection, Woo discloses all the elements of the structure of the invention, including the claimed material of the layers. Flowability of the layers is an inherent property of the material of the layers. See *In re Swinehart*, 439 F.2d 210, 212-13, 169 USPQ 226, 229 (CCPA 1971) "where the Patent Office has reason to believe that a functional limitation

asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristics relied on "); and *In re Fitzgerald*, 619 F.2d 67, 205 USPQ 594 (CCPA 1980) (a case indicating that the burden of proof can be shifted to the applicant to show that the subject matter of the prior art does not possess the characteristic relied on whether the rejection is based on inherency under 35 U.S.C. 102 or obviousness under 35 U.S.C. 103).

Appellants argue that Woo does not disclose how to select among the candidate materials to produce the combination of layers recited by the claimed invention. This argument is traversed and deemed unpersuasive. Woo is not necessarily relied on for how to select among the candidate materials to produce the combination of layers recited by the claimed invention. In any case, as elucidated in the rejection, Woo discloses the combination of layers recited by the claimed invention. Note that the claimed invention is a semiconductor device. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

Rejection of Claims 39-42 under 35 U.S.C. 103(a)

Appellants argue that Woo and Cheung do not disclose any layers being in a reflow state. This argument is traversed. As elucidated in the rejection, Woo discloses all the elements of the structure of the invention, including the claimed material of the layers. Woo additionally discloses depositing a polysilicon interconnection layer and siliciding the polysilicon interconnection layer after the first, second and barrier layers have been formed. Like Woo, Cheung discloses depositing a polysilicon interconnection layer and siliciding the polysilicon layer. Cheung teaches that the polysilicon can be successfully silicided by depositing a layer of refractory metal on the polysilicon layer and annealing the substrate at a temperature of 600-800°C. At the given temperature range, which covers the claimed temperature of 700°C, the layers disclosed by Woo would appear to inherently be in a reflow state. See *In re Swinehart*, 439 F.2d 210, 212-13, 169 USPQ 226, 229 (CCPA 1971) "where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristics relied on "); and *In re Fitzgerald*, 619 F.2d 67, 205 USPQ 594 (CCPA 1980) (a case indicating that the burden of proof can be shifted to the applicant to show that the subject matter of the prior art does not possess the characteristic relied on whether the rejection is based on inherency under 35 U.S.C. 102 or obviousness under 35 U.S.C. 103). Woo does

disclose the layers being in a reflow state, and Cheung was relied on to show that the claimed temperature is known.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

BHA

Conferees:

David Blum

Zandra Smith

Zandra V. Smith
Supervisory Patent Examiner
8 le June 2007